Serial No.: 10/627,433

REMARKS/ARGUMENTS

This response is timely filed as it is filed within the three (3) month shortened statutory period for response to the outstanding Office Action. Further, as this response is hereby filed within two (2) months of the mailing date of the outstanding Office Action, it is understood that the shortened statutory period will expire on the date the advisory action is mailed should such advisory action not be mailed until after the end of the three-month shortened statutory period.

Claims 1-4 and 6-33 remain in the application.

Claim Rejections - 35 U.S.C. §112

The withdrawal of the various prior rejections under §112 is acknowledged with appreciation.

Claim Rejections - 35 U.S.C. §103

1. Claims 1-4, 7-13, 16-23, 25-29 and 31-33 were rejected under 35 U.S.C. §103(a) as being unpatentable over Publication No. US2003/0145921 to Blomquist et al. (hereinafter " Blomquist").

The subject Action sets forth that such rejections are "for the reasons of record in the previous action." In that previous action, the Examiner set forth that Blomquist discloses a gas generating composition that when ignited produces a gas and fills the airbag in an airbag device. The previous Action further set forth that the composition "comprises a fuel from 0-50 % such as guanidine nitrate (para. 0061), a mixture of oxidizers such as basic copper nitrate at more than 50 %, iron oxide at less

than 50 % and up to 30 % of ammonium perchlorate (para. 0049-0055) all with respect to the total of the oxidizer in the composition" and that the gas generating composition is formed by mixing. While the previous Action acknowledged that there was no example that used the claimed composition with the exact amounts, that Action alleged that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the particular oxidizers "since Blomquist suggests that a mixture of three is used and also to vary the amounts of the particular ingredients of the gas generating composition to achieve a desired result."

It is respectfully submitted that the Action fails to acknowledge or appreciate that in those examples in Blomquist wherein the gas generating material compositions contain ammonium perchlorate (AP), the gas generating materials **also contain sodium nitrate**. (See Examples 14-18, in TABLE 2, page 8 and Examples 20-26, in TABLE 3, page 9.) In this regard, Blomquist specifically teaches that:

> The ratio of sodium nitrate (NaN) to ammonium perchlorate (AP) in the mixture is that effective to yield upon combustion sodium chloride. (See paragraph [0101].)

In sharp contrast to Blomquist, the subject application specifically discloses:

> Hydrogen chloride gas can be "scavenged" or removed from the combustion gas stream by including a scavenger compound such as an alkali or alkaline earth metal nitrate such as sodium or potassium nitrate in the pyrotechnic gas generant composition. Such alkali or alkaline

earth metal nitrates react with the hydrogen chloride to produce less or nontoxic alkali or alkaline earth metal chlorides such as sodium or potassium chloride. However, such alkali or alkaline earth metal chlorides may undesirably form as fine particulate matter or dust which can escape the inflator device. (See page 4, lines 8-15.)

In view of such drawbacks relative to the inclusion of such other chlorine scavengers, the pending claims specifically require that "**at least about 98 weight percent of the chlorine scavenger**" be a copper-containing compound selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof. (See claim 1, emphasis added, for example.)

As Blomquist teaches and all the examples thereof that contain AP require the inclusion of the chlorine scavenger sodium nitrate, it is respectfully submitted that Blomquist fails to show or suggest a chlorine-containing gas generant composition that consists essentially of a nitrogen-containing fuel; ammonium perchlorate oxidizer; and a chlorine scavenger present in an amount effective to result in a gaseous effluent that is substantially free of hydrogen chloride when the gas generant is combusted; **wherein at least about 98 weight percent of the chlorine scavenger is a copper-containing compound** selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof, as required in the claimed invention.

The outstanding Office Action states that the "oxidizer mixture" of Blomquist "may be at least 98% basic copper oxide, as the other oxidizers are optional."

The claimed invention, however, requires that "98 weight percent **of the chlorine scavenger** is a copper-containing compound selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof", **NOT** 98% of the oxidizer mixture.

Moreover, the claimed invention requires the chlorine-containing gas generant composition consist essentially of a nitrogen-containing fuel; ammonium perchlorate oxidizer; and a chlorine scavenger. Thus, the claimed invention is specifically and expressly directed to chlorine-containing gas generant composition having ammonium perchlorate as oxidizer, not compositions with basic copper oxide as an oxidizer. In this regard, the application states:

> [T]here is a need and a demand for a pyrotechnic gas generant composition that takes advantage of the increased heat and oxygen provided by utilizing ammonium perchlorate as an oxidizer without increasing undesirable gaseous and particulate combustion byproducts in the inflation gas stream. [see page 4, line 19 through page 5, line 1.]

As noted above, the gas generating material compositions of Blomquist that contain ammonium perchlorate (AP) **also contain sodium nitrate**. No composition of Blomquist consists essentially of a nitrogen-containing fuel; ammonium perchlorate oxidizer; and a chlorine scavenger present in an amount

effective to result in a gaseous effluent that is substantially free of hydrogen chloride when the gas generant is combusted; wherein at least about 98 weight percent of the chlorine scavenger is a copper-containing compound selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof, as claimed.

Moreover, Blomquist specifically teaches:

> The oxidizer comprises a first oxidizer that is basic copper nitrate ($Cu(NO_3)_2 \cdot 3Cu(OH)_2$). **Basic copper nitrate is prized for its combination of density, oxygen yield, and gas yield. Moreover, basic copper nitrate produces upon combustion a condensed material that is readily filterable.** [paragraph 00047, emphasis added.]

> **While basic copper nitrate can be used as the sole oxidizer, the oxidizer preferably includes additional oxidizers.** [paragraph 0051, emphasis added.]

> The amount of metal oxide in the oxidizer is preferably less than about 50% by weight of the oxidizer. More preferably, the ratio of basic copper nitrate to the metal oxide in the oxidizer is from about 1.5:1 to about 3:1. This ratio of basic copper nitrate to metal oxide in the oxidizer is selected to optimize the tradeoff of the volume of gas produced upon combustion of the gas generating material versus the production of undesired gaseous species, such as nitrogen oxides. More preferably, the ratio of basic copper nitrate to the metal oxide is about 2:1. [paragraph 0052]

> In addition to the basic copper nitrate and the metal oxide, the oxidizer of the gas generating material **can also include a small portion of conventional oxidizers** based on nitrates, perchlorates, and/or chlorates. Examples of these conventional oxidizers include alkali metal nitrates, alkaline earth metal nitrates, ammonium nitrate, alkali metal perchlorates, alkaline earth metal perchlorates, **ammonium perchlorate**, alkali metal chlorates, alkaline earth metal chlorates,

coordination complexes of these oxidizers, and mixtures thereof. [paragraph 0054, emphasis added.]

The amount of conventional oxidizers in the oxidizers **is limited** in order to keep as low as possible the combustion temperatures and to limit the amount of difficult-to-condense residues that are produced upon combustion. [paragraph 0055, emphasis added.]

Thus, Blomquist specifically and expressly differentiates between the inclusion and use of basic copper nitrate, metal oxides and "conventional oxidizers" as oxidizers in the composition thereof. Moreover, Blomquist expressly states that the inclusion of "conventional oxidizers" are in "addition to the basic copper nitrate and the metal oxide". (See paragraph [0054], lines 2-4) In view of such specific and express teaching in Blomquist, it is respectfully submitted that the claimed invention which employs "consisting essentially of" transition terminology is patentable thereover.

Clearly, the disclosure of Blomquist wherein the amount of a "conventional oxidizer" such as ammonium perchlorate is specifically taught as being limited fails to show or suggest a composition consisting essentially of a nitrogen-containing fuel; ammonium perchlorate oxidizer; and a chlorine scavenger, as claimed.

In view of the above, the withdrawal of such basis of rejection is requested and notification

Moreover, as the only prior art grounds of rejection relative to claims 7, 16, 25 and 31 were based on Blomquist and as such prior art grounds of rejection are believed to have been shown as improper, these claims are believed to be patentable over the prior art of record and notification to that effect is solicited.

2. Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Blomquist in view of U.S. Patent 5,641,938 to Holland et al. (hereinafter "Holland").

The subject Action sets forth that such rejection is "for the reasons of record in the previous action." In that previous action, Holland had been cited as disclosing the use of an iron blue pigment as an additive to a gas generating composition. The Action alleged that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the iron blue pigment as taught by Holland since it is a known additive used in gas generating compositions.

Such rejection is respectfully traversed.

Claim 14 is a dependent claim and is indirectly dependent on claim 1. The shortcomings of Blomquist, discussed above, relative to the invention of claim 1 are not in anyway overcome or otherwise effectively addressed by the combination of Holland with Blomquist. Thus as claim 1 is believed to be patentable over the prior art of record, so too claim 14 which depends thereon is also believed to be patentable over the prior art of record and notification to that effect is solicited.

3. Claims 1-4, 6, 8-13, 15, 17-24, 26-30, 32 and 33 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,241,281 to Hinshaw et al. (hereinafter "Hinshaw").

The subject Action sets forth that such rejections are "for the reasons of record in the previous action." In that previous action, Hinshaw was cited as disclosing a gas generating composition for use in an airbag device which comprises 30-90 % of copper diammine dinitrate, a co-oxidizer such as ammonium perchlorate and a fuel such as guanidine nitrate. That previous Action further set forth that the composition can also comprise additives such as iron oxide or silicon oxide. While the previous Action acknowledged that there is no example that uses the claimed composition with the exact amounts, the Action alleged that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use "copper diammine dinitrate with the ammonium perchlorate since Hinshaw suggests that a mixture of the two is used and also to vary the amounts of the particular ingredients of the gas generating composition to achieve a desired result."

It is noted that Hinshaw teaches and discloses the incorporation and use of a co-oxidizer thereof in conjunction with the compositional inclusion of a binder.

See for example, column 3, lines 18-21, which recite:

> A co-oxidizer can also be provided primarily to permit efficient combustion of the binder. Importantly, the production of undesirable gases or particulates is substantially reduced or eliminated.

and, column 4, lines 34-36, which recite:

> A co-oxidizer can be provided primarily to permit efficient combustion of the binder.

Clearly, such compositions do not correspond to chlorine-containing gas generant composition consisting essentially of:

a nitrogen-containing fuel;

ammonium perchlorate oxidizer; and

a chlorine scavenger present in an amount effective to result in a gaseous effluent that is substantially free of hydrogen chloride when the gas generant is combusted;

wherein at least about 98 weight percent of the chlorine scavenger is a copper-containing compound selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof, as claimed in claim 1, for example.

Nor do such compositions correspond to chlorine-containing gas generant composition providing an improved gaseous effluent, that consist essentially of:

about 1 to about 20 composition weight percent ammonium perchlorate oxidizer; and

about 80 to about 99 composition weight percent of a precursor blend including:

guanidine nitrate fuel; and

a chlorine scavenger in an amount effective to result in a gaseous effluent substantially free of hydrogen chloride,

wherein at least about 98 weight percent of the chlorine scavenger is a copper-containing compound selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof, as claimed by independent claim 21.

Moreover, as shown by the examples included in the subject application, the invention provides chlorine-containing gas generant compositions having or resulting in an improved effluent. In particular, the present invention provides a chlorine-containing gas generant including ammonium perchlorate oxidizer and a precursor blend containing a nitrogen-containing fuel and a chlorine scavenger in an amount effective to result in a gaseous effluent that is substantially free of hydrogen chloride when the gas generant composition is combusted, wherein at least about 98 weight percent of the chlorine scavenger is a copper-containing compound. Moreover, the present invention provides a chlorine-containing gas generant composition that produces lower levels of undesirable trace gas species such as carbon monoxide and nitric oxide upon combustion. Additionally, the present invention

provides a chlorine-containing gas generant composition having an improved burn rate and gas yield when compared to an ammonium perchlorate-free gas generant composition.

It is respectfully submitted that the attainment of such results (e.g., simultaneous attainment of desirably high burn rates and gas yield when compared to ammonium perchlorate-free gas generant compositions, and a gaseous effluent that is substantially free of hydrogen chloride when the gas generant composition is combusted, via the inclusion of a copper-containing compound chlorine scavenger, as claimed, see the examples on page 16, line 3 through page 22, line 2 of the application) is nowhere shown or suggested by the prior art and constitute unexpected results further supporting the patentability of the pending claims.

Furthermore, the claimed compositions require certain specified materials in certain specified relative amounts or proportions.

It is respectfully submitted that the listings in Hinshaw of possible materials (e.g., various metals and the various complexes thereof, various binders, various co-oxidizers, various cool burning organic nitrogen compounds, etc.) are so broad as to fail to provide an appropriate teaching or suggestion to arrive at the specifically claimed compositions. For example, Hinshaw, at column 8, line 32 through column 9, line 30 identifies and provides a long list of various suitable co-oxidizers for use in the practice of the invention thereof. Moreover, Hinshaw even

teaches that cobalt is the preferred metal for the metal complex used therein and proceeds to list other preferred metals as including magnesium, manganese, copper, zinc, and tin and examples of less preferred but useable metals as including nickel, titanium, chromium, rhodium, iridium, ruthenium and platinum. (See column 5, lines 61-67.)

Thus, it is respectfully submitted that the mere mention in Hinshaw of NH_4ClO_4 as a possible co-oxidizer and copper as a possible metal for the complex fails to provide a proper and necessary teaching sufficient and appropriate to render the claimed invention obvious thereover, particularly as Hinshaw appears silent with regard to chlorine being present as a result of any ammonium perchlorate and any means for the removal or scavenging of such chlorine let alone that the compositions contain "a chlorine scavenger present in an amount effective to result in a gaseous effluent that is substantially free of hydrogen chloride when the gas generant is combusted; wherein at least about 98 weight percent of the chlorine scavenger is a copper-containing compound selected from the group consisting of copper nitrate complexes, basic copper nitrate, cupric oxide, and combinations thereof", as claimed.

In view of the above, claims 1-4, 6, 8-13, 15, 17-24, 26-30, 32 and 33 are believed to be patentable over Hinshaw and notification to that effect is solicited.

4. Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hinshaw in view of Holland.

The subject Action sets forth that such rejection is "for the reasons of record in the previous action." In that previous action, Holland was cited as disclosing the use of an iron blue pigment as an additive to a gas generating composition. The Action alleged that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the iron blue pigment as taught by Holland since it is a known additive used in gas generating compositions.

Such rejection is respectfully traversed.

Claim 14 is a dependent claim and is indirectly dependent on claim 1. The shortcomings of Hinshaw, discussed above, relative to the invention of claim 1 are not in anyway overcome or otherwise effectively addressed by the combination of Holland with Hinshaw. Thus as claim 1 is believed to be patentable over the prior art of record, so too claim 14 which depends thereon is also believed to be patentable over the prior art of record and notification to that effect is solicited.

Conclusion

In view of the above, all pending claims are believed to be in condition for allowance and notification to that effect is solicited. However, should the Examiner detect any remaining issue or have any question, this is an expressed request for a telephone interview between the undersigned and the Examiner to discuss and desirably resolve any such issue or question.

Respectfully submitted,

Nick C. Kottis
Registration No. 31,974

Pauley Petersen & Erickson
2800 West Higgins Road; Suite 365
Hoffman Estates, Illinois 60195
TEL (847) 490-1400
FAX (847) 490-1403